

REMARKS

Claims 11-12 and 14-30 are pending. Favorable reconsideration is respectfully requested.

The present invention relates to an alkoxylate of the formula (I)



where

A is propyleneoxy-or buteneoxy,

n is a number in the range from 1 to 1.8,

m is a number in the range from 3 to 14,

wherein propyleneoxy or buteneoxy units are firstly joined the alcohol radical, followed by ethyleneoxy units.

See Claim 15.

The present invention also relates to a composition comprising an alkoxylate of the formula (I):



where

A is propyleneoxy-or buteneoxy,

n is a number in the range from 1 to 1.8,

m is a number in the range from 3 to 14,

and one or more additives,

wherein propyleneoxy or buteneoxy units are firstly joined the alcohol radical, followed by ethyleneoxy units.

See Claim 11.

The rejections of the claims under 35 U.S.C. §102(b) or §103(a) set forth in paragraphs 4-9 of the Office Action over Dahlgren et al. (WO 94/11331), Gumbel et al. (U.S. 6,680,412), Hoffarth (U.S. 5,705,476), and Clement et al. (WO 01/04183), and combinations thereof, and the obviousness-type double patenting rejection over Claims 1-21 of Gumbel et al. set forth in paragraph 11 of the Office Action are respectfully traversed. The cited references neither disclose nor suggest the claimed composition or alkoxylate.

Dahlgren et al. disclose alkoxylates of 2-propylheptanol of general formula (I), where A is an alkyleneoxy group having 2 to 4 carbon atoms. See abstract and page 2, lines 1 to 21 of the reference. As described on page 2, alkylalkoxylates of general formula (I) comprise alkyleneoxy groups having 2 to 4 carbon atoms in an amount of 10 to 16 units. According to Dahlgren et al., if different alkylene oxy groups are present in the same compound, they may be added randomly or in block. In addition, in alkoxylates of general formula (II), ethylene oxide units are present directly connected to the alkyl chain, and a subsequent block of alkylene oxide units having three or four carbon atoms are added to the ethylene oxide block. Therefore, according to Dahlgren et al., it is mandatory, that ethylene oxide units are connected directly to the alkyl chain, and that alkylene oxide units having three or four carbon atoms are connected to this ethylene oxide block.

In contrast to Dahlgren et al., Claim 11 specifies an alkoxylate of formula (I) comprising 1 to 1.8 units of propylene oxide or butylene oxide and 3 to 14 units of ethylene oxide, where propylene oxide or butylene oxide units are firstly joined to the alcohol radical, followed by ethylene oxide units.

The difference between the alkoxylate in the composition specified in Claim 11 and the disclosure of Dahlgren et al. is that Dahlgren et al. disclose an alkoxylate having ethylene oxide- and C3/C4-alkylene oxide blocks in one molecule, see formula (I) on page 2, or which have directly connected to the alkyl chain an ethylene oxide block, which is connected with a block of propylene- or butane-oxide units, see formula (II) on page 2.

An alkoxylate of formula (I) according to the present invention having a relatively short block of propylene oxide units connected directly to a 2-propyl-heptyl radical and having a relatively long ethylene oxide block connected to said first propylene oxide block as claimed in Claim 11 of the present application, is not disclosed in Dahlgren et al.

Therefore, Dahlgren et al. do not anticipate the composition according to Claim 11 or the alkoxylate according to Claim 15 of the present application,

In addition, Dahlgren et al disclose that alkoxylates are obtained by a polymerization reaction that is catalyzed by basic catalysts, see page 2, last paragraph. A preparation reaction that is catalyzed by double metal cyanide catalysts, as claimed in Claims 19 and 19 of the present invention, is not disclosed in Dahlgren et al,. Therefore, Dahlgren et al., do not describe a process as recited in Claims 18 and 19.

Gumbel et al. disclose alkoxylates according to formula (I), see column 1, line 45 to column 2, line 7. According to formula (I) of Gumbel et al., an alkoxylate is disclosed bearing up to four different blocks of alkyleneoxide units in amounts of 0 to 50 units in each block, where monomers based on ethylene oxide, propylene oxide, butene oxide, pentene oxide, hexene oxide or heptene oxide can be present. The preferred embodiments according to Gumbel et al. are alkoxylates, in which an ethylene oxide block is directly connected to the alkyl radical R¹, see column 2, line 33 to 47.

In contrast to the disclosure of Gumbel et al., Claim 11 specifies an alkoxylate in which propylene oxide or butylene oxide units are directly connected to the 2-propyl-heptyl radical, and ethylene oxide units are connected to the mentioned propylene oxide block. In addition, Gumbel et al. disclose a broad range of possible amounts of the different alkylene oxide units, being from 0 to 50 units, whereas in the alkoxylate according to amended claims 11 of the present application a short and precisely defined propylene or butylene oxide block is present in combination with a relatively long ethylene oxide block. Gumbel et al. do not disclose the specific combination of a short propylene oxide block and a relatively large ethylene oxide block. In addition, Gumbel et al. disclose that alkoxylates are obtained by a reaction that is catalyzed by basic catalysts (see the examples therein).

Therefore, the composition comprising an alkoxylate according to Claim 11, the alkoxylate according to Claim 15 and the process according to Claims 18 and 19 of the present invention are not disclosed by Gumbel et al.

Hoffarth et al. disclose an alkoxylate of general formula (Ic), in which R² can be a decyl radical, 1 to 10 propylene oxide units are attached to said radical, and 1 to 10 units of ethylene oxide are attached to this propylene oxide block. According to the examples of Hoffarth et al., n-decanol or iso-decanol are the basis for the alkyl radical R².

In contrast to the disclosure of Hoffarth et al., in Claim 11 of the present application an alkoxylate of formula (I) is claimed, comprising a very specific alkyl radical, 2-propyl-heptyl radical, and a very short block of 1 to 1.8 units propylene or butylene oxide directly connected to the alkyl radical, and a relatively long ethylene oxide-block connected to the first propylene oxide block. Whereas Hoffarth et al. disclose that propylene oxide- and ethylene oxide blocks shall be of about the same length, Claim 11 of the present application specifies an alkoxylate of formula (I) bearing a specific combination of a specific alkyl radical, a short propylene oxide block and a relatively long ethylene oxide block. The

specific combination of alkyl radical, and length of propylene oxide-block and ethylene oxide-block is not disclosed in Hoffarth et al. In addition, Hoffarth et al disclose a process for the preparation of alkoxylates that is catalysed by basic catalysts (see the examples). Hoffarth et al., do not disclose a process in which double metal cyanide catalysts are utilized.

Therefore, a person having ordinary skill in the art with Hoffarth et al. would not arrive at the composition of Claim 11, the alkoxylate of Claim 15 or at the process according to Claims 18 and 19.

Hoffarth et al. disclose alkoxylates of general formula (Ic), in which 1 to 10 equivalents of propylene oxide are attached to a decyl radical and I to 10 equivalents of ethylene oxide are attached to thus propylene oxide block, see column 1, line 43 to column 2, line 20. According to the examples of Hoffarth et al., iso-decanol or n-decanol is only ethoxylated, but not propoxylated, see column 4, lines 37 to 67.

Moreover, the very specific combination of 2-propyl-heptanol as a starting alcohol in connection with a relatively short propylene or butylene oxide chain of only 1 to 1.8 units of propylene oxide and in connection with a relatively long ethylene oxide block of 3 to 14 units of ethylene oxide gives rise to significantly and unexpectedly improved characteristics.

According to examples 1 to 3, alkoxylates according to formula (I) of Claim 11 of the present application can be obtained by alkoxylation of the mentioned starting alcohol firstly with propylene oxide and after completion reaction with ethylene oxide. Alkoxylates bearing 1.5 units propylene oxides and 6, 8 or 10 units ethylene oxide are obtained by this process. As comparative example C1 2-propylheptanol is only alkoxylated with 8 units of ethylene oxide, and as comparative example C2 2-propylheptanol is firstly alkoxylated with 8 units of ethylene oxide and subsequently alkoxylated with 1.5 units of propylene oxide.

To show the improved characteristics of the inventive alkoxylates according to amended claim 11 of the present application, the alkoxylates are used for wetting glass, polyethylene and steel. The contact angle of a concentration of 1.2 g/l in water was measured at a temperature of 40°C, see tables on pages 14 and 15 of the specification. The inventive alkoxylate having a short propylene oxide block directly connected to the 2-propyl-heptyl radical, and a relatively long ethylene oxide block connected to the propylene oxide block, show throughout lower contact angles compared to comparative alkoxylates C1 and C2 respectively.

Another significant advantage of the alkoxylate of formula (I) according to the present invention is that the contact angle decreases faster than the contact angle decreases of the alkoxylate C1 or C2, which is a proof for the very fast wetting of alkoxylates according to amended Claims 11 and 15 of the present application.

According to the second table on page 15 of the description, the inventive alkoxylate shows a wetting on cotton which is improved by 50 or 70%, compared to alkoxylates having only ethylene oxide units or having ethylene oxide units and propylene oxide units but ethylene oxide units connected directly to the alkyl radical.

In addition, alkoxylate compositions according to Claim 11 and alkoxylates according to Claim 15 of the present application, show a significantly decreased amount of residual alcohol of only 0.8 g/100 g compared to 1.9 or 4.3 g/100 g in alkoxylates C1 and C2. This decreased amount of alcohol is the result of the propoxylation carried out first according to the invention and ethoxylation which is only carried out subsequently, since propylene oxide is added more uniformly to the alcohol component than ethylene oxide is. In contrast thereto, ethylene oxide preferably reacts with ethoxylates, meaning that in the case of an initial use of ethylene oxide for the reaction with the alkanols, both a broad homolog distribution and also a high content of residual alcohol result.

The avoidance of relatively large amounts of residual alcohol present in the product is particularly advantageous for odor reasons, the alcohols used according to the invention generally have an intrinsic odor which can, be largely suppressed by complete alkoxylation as it is possible with the composition according to Claim 11 and the alkoxylate according to Claim 15. Alkoxylates obtained by customary processes have a high intrinsic odor which is undesired for applications, see page 9, lines 10 to 20 of the specification. When alcohols that are substituted at the 2-position, like 2-propylheptanol, are alkoxylated, in general large amounts of residual alcohol are obtained in the reaction product because the –OH functionality is sterically hindered by the substituent in 2-position. Therefore, it is surprising for a person having ordinary skill in the art that unexpectedly low amounts of residual alcohol are present in the composition according to Claim 11 or in the alkoxylate according to Claim 15 although 2propyl-heptanol is the basis for these alkoxylates.

The last table on page 15 of the specification shows that interfacial tension of the compositions according to claim 11 and the alkoxylates according to claim 15 is significantly decreased, compared to comparative examples C1 or C2.

The corresponding data for example 2, which is presented in the tables on pages 16 and 17 is in accordance with the data that has been discussed for example 1 above.

Another important advantage of the composition according Claim 11 and the alkoxylate according to Claim 15 is that the very specific combination of 2-propyl-heptanol, a short block of propylene or butylene oxide and a relatively large block of ethylene oxide makes it possible that the biodegradability of these alkoxylates is significantly improved. The applicant has conducted tests according to European standard OECD 301 which is a test alkoxylates have to pass before they can be incorporated into consumer products in Europe. In this test the biodegradability of alkoxylates is tested. A compound is classified as “readily biodegradable” if at least 60% of the compound is decomposed within 10 days. A compound

has to be classified as “readily biodegradable” in order to be allowed to be sold as a consumer product.

Compositions according to Claim 11 and alkoxylates according to Claim 15 are classified as “readily biodegradable”, whereas compounds according to comparative examples C1 and C2 did not pass the OECD 301 test. This shows that the combination of length of blocks and sequence of these blocks have a significant impact on the biodegradability of the compounds.

Further experiments have been conducted by the applicant. Comparative alkoxylates having 2-propyl-heptanol as the alcohol component, being alkoxylated with two equivalents of propylene oxide, followed by ethoxylation with 3, 5 or 9 equivalents of ethylene oxide have been prepared. These alkoxylates having a slightly longer propylene oxide chain than the alkoxylates according to Claim 15 that are present in the composition according to Claim 11 did not pass the OECD 301 test and were not classified as “readily biodegradable”. This result shows that the amount of propylene oxide has to be in the specific range as claimed in Claims 11 and 15 in order to have alkoxylates that have the advantageous combination of physical characteristics and biodegradability as mentioned above.

The experimental data which is disclosed in the present application and the further experiments conducted by the applicant significantly show that the very specific combination of the 2-propyl-heptanol radical, a very small block of propylene oxide directly connected to said radical and a relatively long ethylene oxide block connected to the propylene oxide block, give rise to characteristics of the alkoxylates obtained there from, which are improved compared to the characteristics of alkoxylates having the same amounts of propylene oxides and ethylene oxide but having the ethylene oxide block directly connected to the radical, or just having ethylene oxide in the chain.

Hoffarth et al. disclose that alkoxylates having propylene oxide units and ethylene oxide units in the chain are suitable components in a low-foaming wetting agent composition. Hoffarth et al. do not disclose that a specific combination of the very short propylene oxide block and relatively long ethylene oxide block gives rise to the advantageous behavior that could be shown by the examples of the present invention. In addition, Hoffarth et al. disclose that decyl, n-decyl or iso-decyl is a suitable radical, but do not suggest that 2-propyl-heptanol gives rise to the advantages as discussed above which are, for example, an advantageous combination of excellent physical data, improved biodegradability and low amount of residual alcohol.

In general, if alcohols that are substituted in 2-position, are alkoxylated, high amounts of residual alcohol is present in the reaction mixture, as mentioned above. Because Hoffarth et al. do not disclose alkoxylates that are based on 2-substituted alcohols, Hoffarth et al. cannot teach that alkoxylates as claimed in Claim 15 or present in compositions according to Claim 11 can be obtained with low residual alcohol. Because the alcohols that are disclosed in Hoffarth et al. do not cause a high amount of residual alcohol because of missing of a substituent in 2-position Hoffarth et al. can not teach a person having ordinary skill in the art how to avoid a high amount of residual alcohol as it is the case with compositions and alkoxylates according to the present invention.

In addition, the disclosure that propylene oxide and ethylene oxide shall be present in amounts of 1 to 10 units per alkyl radical, does not point in the direction that propylene oxide shall be present in a short block, and ethylene oxide shall be present in a longer block, as it is claimed in Claim 11 of the present application.

Therefore, a person having ordinary skill in the art does not learn from Hoffarth et al. to prepare an alkoxylate according to Claim 11, and to use this as a surfactant, comprising the advantageous characteristics discussed herein.

In addition, Gumbel et al. and Dahlgren et al. cannot point in the direction of the alkoxylates according to Claim 11, because the very broad disclosure of alkoxylates to Gumbel et al. and Dahlgren et al. does not point in the direction of the very specific and precise alkoxylate specified in Claim 11.

In addition, a combination of one of these references with Clement et al. would not result in a process as claimed in Claims 18 and 19, because the very specific combination of alkyl radical, short propylene oxide block and ethylene oxide block in an alkoxylate that is prepared by a reaction that is catalyzed by a double metal cyanide catalyst is not suggested in one of these references. Although a skilled person does learn the alkoxylation reaction can be catalyzed by double metal cyanide, this knowledge does not lead to a process for the preparation of the specific alkoxylates as claimed.

Therefore, from our point of view, the process according to Claims 18 and 19 of the present application is non-obvious in light of a combination of Clement et al., with one of the other cited references.

In view of the foregoing, the cited references fail to disclose or suggest the claimed composition or alkoxylate. Accordingly, withdrawal of those grounds of rejection is respectfully requested.

The obviousness-type double patenting rejection over Claims 1-9 of application serial No. 10/575,760 is respectfully traversed. The claims of that application fail to disclose the composition or the alkoxylate specified in the claims of the present application, particularly in view of the advantages thereof discussed above. Accordingly, withdrawal of this ground of rejection is respectfully requested.

Application No. 10/510,715
Reply to Office Action of June 8, 2007

Applicants submit that the present application is in condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

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